

Cercarial Dermatitis In Kelantan, Malaysia An Occupation Related Health Problem

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Introduction: Kelantan, an east coast state of Peninsular Malaysia is rich in culture and supports a population that is dependent on agriculture. The crops cultivated are mainly paddy and rubber but in recent years tobacco is beginning to gain importance over paddy. We centered our study around Bachok District which is about 25 kilometers east of Kota Bharu, the state capital.

Methods: Based on case reports we focused our study on cercarial dermatitis and also recorded the socioeconomic status of the people in the four study villages.

Result: The ducks and cows were the common livestock kept by the farmers and these were found to be significantly associated ($P=0.05$) with the occurrence of dermatitis. Cercariae shedding by snails were found in waters used for irrigation.

Conclusion: The results indicate that cercarial dermatitis is occupation specific, and its debilitating effect was having an influence on the socioeconomic status and general wellbeing of the population in these villages. The dermatitis occurred only during the field preparation and transplanting stages of paddy and was found to be significantly associated ($P<0.05$) with the source of water used for irrigation. The water sources for irrigation was mainly from the river and irrigation canal and the snail *Indoplanorbis exustus* infected with schistosome cercariae was found to be abundant in both these sources during these stages. The ducks and cows were the common livestock kept by the farmers and these were also found to be significantly associated ($P=0.05$) with the occurrence of dermatitis. Therefore we concluded that the dermatitis among paddy farmers in Bachok District was due to an animal schistosome.

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Key Words: Environment, Occupational health, Disease vectors, Zoonoses

Introduction

Bachok District in Kelantan, a northeastern state in peninsular Malaysia is made up of a farming community

which cultivates paddy, rubber and tobacco. The current study was carried out to assess the socioeconomic status and wellbeing of the people in four villages in the Bachok District and the related health issue of the occurrence of dermatitis among them as an occupational problem.

Dermatitis is an inflammation of the cuticle of the skin and the causes range from chemical (contact dermatitis) to those caused by the larval forms of animal schistosomes. Parasite induced dermatitis is a cutaneous inflammatory response associated with the penetration of the skin by cercariae, the free swimming larval stage of non-human schistosomes¹. It is commonly known as swimmer's itch in some countries and as 'sawah itch' in Malaysia. The definitive hosts for these schistosomes can be either mammals or birds. The larval forms (cercariae) are released from infected snails (intermediate host) into fresh and salt water, such as lakes, ponds, and oceans which may be used for cultivation, swimming and other recreational activities. The cercariae penetrate the skin of humans and die within a few hours triggering an allergic inflammatory response^{2,3,4,5}. The species of schistosomes that may infect man causing cercarial dermatitis in the Asian region are *Schistosoma spindale*⁶, *S. nasale*⁷, *S. incognitum*⁸, *Trichobilharzia brevis*⁹ and *Pseudobilharziella lonchurae*¹⁰. Agrawal *et al.*¹¹ in a letter to the Bulletin of the World Health Organisation have stated that the cause of cercarial dermatitis in India can be attributed to *S. incognitum* and *Orientobilharzia dattai* (found in *Lymnea luteola*) and *S. nasale*, *S. indicum*, and *S. spindale* (found in *Indoplanorbis exustus*). They found these snails in ponds and paddy fields and people exposed to these bodies of water developed dermatitis which was attributed to the cercariae of the non human schistosomes.

The issue that prompted this study was the report from the State Health Department that villagers in a paddy-growing area in Kelantan were complaining of dermatitis that caused intense itch culminating in lesions on the hands and legs after working in the paddy fields. It became a serious problem and in certain areas

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residents were forced to abandon rice growing and opt for tobacco cultivation, thus leading to decreased rice production. Therefore a study was designed to assess the socioeconomic status and the wellbeing of the affected community with a perspective on the activities of the community and the relevance of the environment in this health issue.

Methods

The study was conducted in 4 villages in Kelantan, in the Bachok-Kota Bahru area, 25 km south of Kota Bahru, Peninsular Malaysia (5°07'N and 102°18'E). The villages are Kampung (Kg.) Tok Junuh, Kg. Alor Bakat, Kg. Serdang Muda and Kg. Serdang Surau (also known as Kg. Serdang Tua). The most populated village was Kg. Alor Bakat, followed by Kg. Tok Junuh, Kg. Serdang Muda and Kg. Serdang Surau. All 4 villages are located next to each other and situated close to paddy fields or in between paddy fields.

A survey using a questionnaire was carried out in the 4 villages and the data collected was subjected to statistical analysis (Pearson's Chi-Square Test of Association) using SPSS Version 11.5.1. Person-to-person interviews were also conducted throughout the 4 villages to measure the level of knowledge of the disease, its occurrence and reoccurrence. The questionnaire was constructed to establish the occupation of the interviewee, the occurrence and reoccurrence of the dermatitis, method of farming used, time spent in fields, condition of field, source of water for farming and domestic use, types of animals reared, treatment received for disease, and place and type of treatment. The data were collated and analysed using Pearson's Chi-square Test of Association to establish the occurrence of dermatitis with the study site (village), sex, age group, stages of farming, type of fertilizers and pesticides used, hours spent in the field, water sources and animal husbandry.

Snails and water samples were taken from the canals and the paddy fields. The snails were kept in plastic aquaria with filtered water collected from the paddy fields and the water was examined daily for the presence

of shed cercariae. The cercariae in the water were picked out and examined under the microscope.

Results

Table 1 shows the population size of the villages in terms of sex, age and occupation. Paddy farmers comprised of 12.43%, 18%, 15.9% and 24.4% at Kg. Tok Junuh, Kg. Alor Bakat, Kg. Serdang Muda and Kg. Serdang Surau respectively. When the population of all 4 villages were pooled (N=2080) it was found that the paddy farmers had the highest incidence rate of dermatitis (47.9%) followed by the retired group (2.6%), housewives (0.4%), and students (0.3%). It was also found that 96.6% of the dermatitis cases was related to paddy planting and that there was a statistically significant relationship between type of occupation and prevalence of dermatitis ($P=0.001$).

A total of 359 farmers in the 4 villages were interviewed to determine the occurrence of cercarial dermatitis amongst them. In Kg. Alor Bakat a total of 187 farmers were interviewed and 39% (73) was found to have been infected, in Kg. Tok Junuh it was 58% (29), Kg. Serdang Muda, 48.4% (30) and Kg. Serdang Surau, 66.7% (40). The highest prevalence was in Kg. Serdang Surau, but in terms of numbers of infection Kg. Alor Bakat was the highest. There was significant association between the occurrence of dermatitis among paddy farmers and the village they stayed in ($P=0.001$). The occurrence of dermatitis among the elderly (70 years and above) was high (57.7%) (Table 2), and dermatitis was higher in females (74 out of 151 or 49.0%) than in males (98 out of 208 or 47.1%).

It was also apparent that there was significant association between preparation of field prior to planting and the occurrence of dermatitis ($P=0.031$) and transplanting stage ($P=0.024$) when the field was flooded. But there was no significant association between occurrence of dermatitis and the different methods used in field preparation ($P=0.8290$), sowing of seed stage ($P=0.156$), application of fertilizers ($P=0.253$), different types of fertilizers and pesticides

used ($P=0.342$; $P=0.378$), harvesting stage ($P=0.345$), and hours spent in the field ($P=0.187$).

The majority of the farmers used water sources from the river (50.6%), stream (46.4%), and irrigation canal (1.1%). There was significant association between occurrence of dermatitis and the water sources used for farming ($P=0.038$), but not between types of water sources used for household activities ($P=0.163$).

Five types of animals commonly reared in the villages were chicken, ducks, cows, goats and buffaloes with some pets such as birds and monkeys. There was no significant association found between general animal husbandry such as, rearing of chicken ($P=0.382$), buffaloes ($P=0.286$), goats ($P=0.600$) and the occurrence of dermatitis ($P=0.280$). However there was significant association between rearing of ducks ($P=0.033$) and cows ($P=0.003$).

Repeated infections were reported by respondents (farmers) who were infected. 84.3 % of the farmers were infected for more than two times and 30.4% reporting at least 4 times. Another 30.2% reported infection every time they went into the paddy field to work. About 12.8% of the data was incomplete for analysis.

Among the infected farmers, 94.8% reported infection on both hands and legs, one case, legs only (0.6%), 4 infecting the whole body (2.3%) and data was not available for 4 others (2.3%). The occurrence of itch immediately after leaving the paddy field was 95% (165 cases), severe itch in 65.7% (113 cases) and mild itch in 23.8% (41 cases). In 161 cases (79.1%) the itch occurred day and night, in 22 cases (12.8%) only at night and 4 cases (2.3%) only during the day. Among the infected farmers 91.9% (158 cases) complained of repeated itching and 80.8% (139 cases) said that it occurred only when they went back to work in the wet paddy fields. In most of the infected respondents with itch, the red dots turned to rashes in about 15 days (85.5%). These rashes on healing developed into scars and in most cases (85.5%) the scars disappeared within 30 days, except one incidence of permanent scarring.

One hundred and forty four cases (83.7%) received treatment. Of these, 126 were treated at government clinics, 10 received traditional remedies, 3 were treated at private clinics, 4 were treated at both private and government clinics, and data for 1 case was not available. The type of treatment given was mainly topical applications (27 cases); both oral and topical (1), topical and an injection (1); all 3 types (3); and data for other cases were not available.

Discussion

In this study it was important to establish whether the dermatitis affecting the farmers are contact dermatitis or cercarial dermatitis. Significant associations have been found linking the incidence of dermatitis and the environment in these 4 villages. The main reason to rule out dermatitis caused by chemicals is the lack of association between the application of fertilizers and pesticides. It can be said that the occurrence of dermatitis is occupation specific as there was a prevalence of 47.9% among the paddy farmers. A study in Labu, Negeri Sembilan, a paddy growing area, has shown that the outbreak of cercarial dermatitis in that area was due to *S. spindale*¹².

The study also found that paddy farmers working during the preparation of fields and transplanting stages were more likely to acquire contact dermatitis than at other stages of farming. The water sources for farming from the river and irrigation canal may also likely increase the rate of infection. The rearing of ducks and cows has also been associated with an increase in the risk of infection. Ducks and cows are known to be natural hosts for adult schistosomes. Ruminant survey in Kedah and Negeri Sembilan has identified buffaloes, cows and goats to be carriers of *S. spindale*¹³. However there is no recent data implicating ducks as definitive hosts other than that of Basch⁹.

Snails (*Indoplanorbis exustus*) collected during the survey (data not presented here) were found to shed fork-tailed cercariae which is characteristic of schistosome cercariae that cause cercarial dermatitis. Studies in Malaysia¹⁴ have shown that various species of

aquatic snails (11 different species) collected from different habitats in Johore, Kedah, Kelantan, Malacca, Negeri Sembilan, Pahang, Perak, Perlis, Selangor and Trengganu were all negative for *S. spindale* cercariae, except for *I. exustus* which was positive. However only the snails from Negeri Sembilan, Johore, Kedah and Trengganu were positive as intermediate hosts¹⁵. In these studies the periodicity of cercarial shedding by *I. exustus*, showed a diurnal or phototactic subperiodicity that peaked during the day (light hours) as compared to the night. Maximum number of cercariae were recorded between 0900 and 1200 hours, peaking at 1030 and declining thereafter. This timing coincides with the planting activities of the farmers, thus explaining the reason for the outbreak of dermatitis after every exposure.

The occurrence of cercarial dermatitis among the paddy farmers affects their livelihood as they are unable to work at times due to the severity of the infection. There is also no effective treatment process as evidenced by our survey where only 32 had records of treatment, while the remaining respondents said they were treated but had no records of it. The severity of infection and the lack of effective treatment has a direct impact on the socio-economic status and this problem must be addressed by the relevant authorities. However, the findings of this study cannot be extrapolated to the whole country as the data is very specific to the state of Kelantan and due to time constraint and funds, a detailed study was not carried out. There is definitely a need to identify the species of schistosome that is causing the disease in Kelantan. We know that ducks carry the avian species of *Trichobilharzia*⁹ and cows the bovine species of schistosomes and our study shows that there is a significant link between these animals and the outbreak of dermatitis. Other studies have also shown that in the state of Kedah, the wild Bandicoot (*Bandicota indica*) harbours adult *S. spindale* worms¹⁶. This rodent is found in the paddy fields of Kedah and Perlis¹⁷, but is it present in Kelantan? If it is, then we need to establish whether this animal is a reservoir host

or is it an incidental infection. Studies also show other rodent species to be naturally infected. In Negeri Sembilan, *Rattus tiomanicus* was the host for *S. spindale* and in Kedah, *Bandicota indica*, *Rattus argentiventer* and *Rattus rattus diardii* were the hosts¹⁸.

This study was not able to establish whether the cercarial dermatitis was due to *S. spindale* or *Trichobilharzia* sp. but it did rule out chemical dermatitis. It has also shown that the disease among the population at the 4 villages had significant association with the breeding of animals, paddy planting, aquatic snails and the water source.

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REFERENCES

1. Hoeffler, D.F. Cercarial dermatitis, its etiology, epidemiology, and clinical aspects. Arch Environ Health 1974; 29:225
2. Cort, W.W. Schistosome dermatitis in the United States (Michigan). J Am Med Assoc 1928; 9: 166-176.
3. Oliver, L. Schistosome dermatitis, a sensitization phenomenon. Am J Hyg 1949; 59: 290-302.
4. Macfarlane, W.V. Schistosome dermatitis in New Zealand. 1. The parasite. Am J Hyg 1949; 50: 143-151.
5. Shah, H.L & Agrawal, M.C. Schistosomiasis. In S.C. Parija, eds.: Review of Parasitic Zoonoses. A.I.T.B.S. Publishers, Delhi. 1990.
6. Montgomery, R.E. Observation on bilharziosis among animals in India. Ind J Trop Vet Scien 1906; 1: 138-174.
7. Rao, M.A.N. Bovine nasal schistosomiasis in the Madras Presidency with a description of the parasite. Ind J Vet Scien Anim Husband 1933; 3:29-38.
8. Chandler, A.C. A new Schistosoma infection of man, with notes on other human fluke infections in India. Ind J Med Res 1926; 14: 179-183.
9. Basch, F.B. The life cycle of *Trichobilharzia brevis* n. sp. an avian schistosome from Malaya. Zeit f Parasit 1966; 27: 242-251.
10. Fischthal, J.H & Kuntz, R.E. Additional digenetic trematodes of birds from North Borneo (Malaysia). Proc Helminth Soc Wash 1973; 40: 245-255.
11. Agrawal, M.C., Gupta S., & George, J. Cercarial dermatitis in India. Letters -Bullet WHO 2000; 78 (2) :278

12. Krishnasamy, M., Inder Singh, K., Ambu S., Chong N.L., Hanjeet Kaur, Jeffery J. & Rosli R. Cercarial dermatitis among rice field workers in Labu, Negeri Sembilan, Peninsular Malaysia. Trop Biomed 1995; 12: 109-113.
13. Krishnasamy, M., Lee C.C., Inder Singh K., Amin Babjee S.M., Rehana A.S. & Jeffery J. Studies on animal schistosomes in peninsular Malaysia. I. Description of *Schistosoma spindale* (Montgomery, 1906) from goat and buffalo. Trop Biomed 1991; 8: 161-165
14. Krishnasamy, M., Ambu S., Chong N.L., Jeffery J. & Inder Singh, K. A survey for aquatic snails for the incrimination of intermediate host of *Schistosoma spindale* and other snail-borne trematodes. Trop Biomed 1998; 15: 37-44.
15. Krishnasamy, M., Chong N.L., Ambu S., Jeffery J. & Inder Singh, K. *Schistosoma spindale* cercariae production and shedding periodicity in *Indoplanorbis exustus* snails from Peninsular Malaysia. Trop Biomed 2001; 18: 65-74.
16. Inder Singh, K., Krishnasamy, M. & Stephen Ambu The large bandicoot rat, *Bandicota Indica*, a new host for *Schistosoma spindale*, Montgomery, 1906, in Peninsular Malaysia. S E A J Trop Med Pub Hlth 1992; 23:537-538.
17. Lord Medway, The wild mammals of Malaya (Peninsular Malaysia) and Singapore. 2nd Edn. Oxford University Press, 1976.
18. Inder Singh, K., Krishnasamy, M., Ambu S., Rosli R. & Chong N.L. Studies on animal schistosomes in Peninsular Malaysia: Record of naturally infected animals and additional hosts of *Schistosoma spindale*. S E A J Trop Med Pub Hlth 1997; 28(2): 303-307.

Table 1 : Demographic information on the 4 villages at Kota Bahru, Kelantan.

KG. TOK JUNUH									
POPULATION	HOUSEHOLD	SEX (%)		AGE (YEARS) (%)				OCCUPATION(%)	
		Male	Female	< 10	< 20	21-59	> 60	Farmers	Non-Farmers
402	84	207 (51.6)	195 (48.4)	86 (21.4)	180 (44.8)	87 (21.7)	49 (12.1)	50 (12.4)	353 (87.6)
KG. ALOR BAKAT									
1041	176	531 (51.0)	510 (49.0)	265 (25.5)	564 (54.2)	125 (12.0)	87 (8.3)	187 (18.0)	854 (82.0)
KG. SERDANG MUDA									
391	76	181 (46.3)	210 (53.7)	112 (28.6)	95 (24.3)	147 (36)	37 (9.5)	62 (15.9)	329 (84.1)
KG. SERDANG SURAU (SERDANG TUA)									
246	48	106 (43.1)	140 (56.9)	49 (20.0)	129 (52.4)	29 (11.7)	39 (15.8)	60 (24.4)	186 (75.6)

Table 2 : Occurrence of dermatitis among paddy farmers according to age groups.

AGE GROUPS (IN YEARS)	OCCURRENCE OF DERMATITIS		
	POSITIVE	NEGATIVE	PREVALENCE(%)
20 < 30	6	12	33.3
31 < 40	22	30	42.3
41 < 50	44	46	48.9
51 < 60	63	57	52.5
61 < 70	22	31	41.5
More than 70	15	11	57.7
TOTAL	172	187	47.91